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TEMPERATURE SENSOR HAVING AT LEAST ONE CONDUCTOR TRACK AND METHOD FOR THE MANUFACTURE OF A TEMPERATURE SENSOR

Field of THE INVENTION

The present invention relates to a temperature sensor having at least one conductor track and to a method for manufacturing such a temperature sensor ~~sensor according to the definition of the species in Patent Claim 1 and 5, respectively.~~

Background Information ~~of the Present Invention~~

Temperature sensors ~~of this type~~ are known. They usually have a conductor track, where a temperature-dependent change in a resistance of the conductor track is measured and evaluated. In this context, such a conductor track can be made from a cermet, because cermets are characterized by their especially large resistance temperature coefficients. Prerequisite for measuring the resistance is an existing conductivity.

The known method has the disadvantage that the conductivity of cermets is limited to resistances in the ohm-range. However, a measurement, in which the conductor track exhibits resistances having several hundred ohms is especially favorable for an error-free measurement of the temperature changes. The resistance can, in fact, be increased by reducing the volumetric component of the metal in the cermet, yet the cermet becomes non-conducting below a certain percolation limit. To obtain higher resistances, the conductor track in the known cermet-based temperature sensors is lengthened, thereby rendering it impossible to obtain high resistances in small spaces.

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~~From the German DE 196 36 493 C1 it is known to fabricate~~ a a spark plug resistor using a currentless deposition of a metal

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onto glass or ceramic powder. However, such a spark plug resistor has a resistance range of several thousand ohms and is designed to withstand loads that occur as a result of an applied high voltage. A disadvantage in this context is that manufacture is consequently complicated and expensive.

~~Advantages of the Present Invention~~ SUMMARY OF THE Invention

~~The~~ In the temperature sensor in accordance with the present invention and the method for the manufacture of such a temperature sensor ~~sensor having the features of Claims 1 and 5, respectively, are characterized in that~~ conductor tracks having high resistances are ~~resistances can be~~ manufactured in a simple, cost-effective manner. Due to the fact that the conductor tracks are formed of a metal, which covers one surface of a carrier substrate made of a metal oxide, carbide, or nitride, the resistance is simply determined by one thickness of the metal layer, thereby eliminating the restriction under known methods heretofore of the percolation limit.

Especially advantageous is a high variability of the metal used. A currentless bath is used for the metal deposition process to force the metal onto the carrier. Subsequent thermal treatment then leads to the compression of the moistened areas on the surface of the carrier, thereby creating a conductive layer. Usable metals include cobalt, nickel, copper, platinum, and others.

Ceramic particles, in particular metal oxides, metal carbides, or metal nitrides, such as aluminum oxide or zirconium dioxide, can be used as carriers, zirconium dioxide being particularly suitable for the manufacture of laminated layer sensors. To ensure the functionality of such layer sensors, an exact temperature measurement is often necessary. The temperature sensor in accordance with the present invention only requires a small amount of space and is distinguished by a resistance range that is favorable for temperature

measurements.

Additional preferred refinements of the present invention are derived from the remaining features recited in the dependent claims.

Drawings

The present invention is further elucidated in the following using an exemplary embodiment based on the corresponding drawing, whose figures show:

Figure 1 a schematic plan view of a temperature sensor; and

Figure 2 a schematic sectional view of conductor track particles of the temperature sensor.

Description of the Exemplary Embodiment

Figure 1 illustrates one possible specific embodiment of a temperature sensor 10 according to the present invention. Such a temperature sensor 10 can, for example, be a functional element of a laminated layer sensor. In this case, the sensor has a layer 12, in which a conductor track 14 is embedded that is connected, in turn, via two contact points 16 to an evaluation device not depicted here.

A temperature can be determined by measuring a resistance of conductor track 14. Conductor track 14 is preferably loaded with an a.c. voltage.

If temperature sensor 10 is used in the layer sensor, then conductor track 14 is usually made of a metal oxide, such as zirconium dioxide or aluminum oxide, and of a metal such as platinum.

Figure 2 shows a schematic cross-section of two particles 20 which constitute part of the conductor track 14. Particles 20 include an inner core 22, a boundary layer 28, and an outer

metal layer 26 disposed on a surface 24. Such a particle 20 can be described as follows:

A carrier made of a metal oxide, metal carbide, or metal nitride, which is used as a powder having a selectable grain size, is used as the base material. One single grain of the carrier has surface 24. Especially suited are zirconium dioxide and aluminum oxide grains.

Palladium nuclei, which are used as seed crystals for the currentless deposition of the metals, which are to later form metal layer 26, are initially deposited by reduction on surface 24. The currentless deposition of metals according to this process is generally known and will, therefore, not be more closely explained within the framework of this present description. Metals, such as cobalt, nickel, copper, or platinum, can be deposited.

Once the metals are deposited on surface 24, they undergo a thermal treatment. On the one hand, the treatment compresses and permanently joins metallic layer 26 to surface 24, and, on the other hand, a conductive layer is thereby created, which is represented by conductor track 14, in that adjacent particles 20 in the region of metallic layer 26 fuse together.

The metal can diffuse into carrier grain 22 during the thermal treatment, thereby forming boundary layer 28. A layer thickness d of metal layer 26 can be influenced by the duration of the treatment and the temperature level.

The resistance of such a conductor track 14 is essentially dependent upon metal layer 26. In this context, metal layer 26 represents a layer resistance, whose magnitude is determined by layer thickness d, which is a measure of the conductor track cross-section. By reducing layer thickness d, one can increase the resistance of conductor track 14.